Implementing and testing Ag technologies in your farm under specific soil-weather conditions.

Key Principles… **OFR**

DOING Research yourself

Site-specific-responses (soil-weather)

Get information for your farm and collaborate
Outline: On-Farm Research

STEPS for a successful experience: "Bottom-Up APPROACH"
On-Farm Research: Q-Step

Question (Q) to be answered?

FARMER-driven:

- Q-derived from a farmer
- Farmer-inputs from time “0”
- Farmer-outputs: TEAM-WORK scheme
On-Farm Research (OFR): Q-Step

FARMER perspective: Why should I get involved?

To identify the best management practices (BMPs) for improving productivity and net return.

To base decisions on an “unbiased-data source”.

To use the outcome from the OFR project to ADJUST BMPs and reduce farm-specific YIELD GAP.
Reducing the *Site-specific Yield Gap*

FARMER-YIELD vs. MAXIMUM-YIELD (e.g. BMPs) = YIELD GAP

McCornack, 2015
Effective *Network of Collaborators*

**Key-Players**

- FARMERS
- Extension Ag. Agents
- Extension specialist and Area Agronomists
- Crop Consultants and key-stakeholders
  - CCAs
  - Crop Consultants
On-Farm Research (OFR): P-Step

OFR PROTOCOL: Simple & effective design

Few treatments are tested.

Less measurement-intensive.

Large plot sizes (strips), +variability.

Corn seeding rate x row spacing

Soybean seeding rate
FARMER-driven project: Planting and Harvesting is done by farmers (*time-constraint as main factor*).

General guidelines are provided for planting and harvesting procedures.
On-Farm Research (OFR): P-Step

OFR PROTOCOL: Simple & effective design

Plot size & planting pattern.

Plot Size: Plot size should be at least 300 feet long, but can be as large as 1000 feet long (depending on the space available on the cooperator’s field). The width of the plot should at least be equal to 1.5 to 2 times the width of the combine header.

Planting Pattern: Example.

Harvesting operation

Harvest center of the plots

60-ft wide (30”, 24-rows)
Harvest-center 30-ft (12-rows)

Harvest Operation:

Under 30-in row spacing:
If plots are 60-ft wide (24 rows), only the center 30-ft will be harvested for the research purposes. In similar case, if the plots are 30-ft (12 rows) wide, then the combine header width is 15-ft and only one pass will be needed to harvest the center 15-ft.

Under 20-in row spacing:
If plots are 60-ft wide (36 rows), only the center 30-ft will be harvested, when the combine header width is 30-ft, for the research purposes.

More combinations on row spacing, combine header width, and final plot width can be explored for harvesting purposes.
**On-Farm Research (OFR): GEM-Step**

**OFR GxExM:** Genotype x Environment x Management

- **GENOTYPE:** Hybrid (corn) / variety (soybean)
- **ENVIRONMENT:** Soil/Weather/Crop data
- **MANAGEMENT:** record-keeping of all practices

**GENOTYPE**

If genotype is not part of the test subject, then one hybrid/variety per experiment should be tested to simplify the genotype x management practice effects (G x M).

The farmer will be selecting the variety of his preference (personal choice) or seed can be provided upon request.
On-Farm Research (OFR): GEM-Step

OFR GxExM: Genotype x Environment x Management

ENVIRONMENT

- Soil characterization

- Weather information

- (historical and current growing season)
Account for and Quantify VARIABILITY: “KNOW YOUR FARM”
On-Farm Research (OFR): GEM-Step

OFR GxExM: Genotype x Environment x Management

MANAGEMENT

Record-keeping (Trial information)

In-season DATA:
- STAND COUNTS
- IMAGERY COLLECTION
- DISEASE/INSECT NOTES
- PICTURES of production problems
- SOIL/PLANT test depending on the time/funding
On-Farm Research (OFR): GEM-Step

OFR GxE%M: Genotype x Environment x Management

**MANAGEMENT**

Scouting-Protocol (e.g. STAND COUNTS)

**TIMING** (early vs. late-season)

**Size of Row**

- **30” row spacing**
  - 17.5 feet
  - 7.5 in
- 15 in
- 30 in
On-Farm Research (OFR): GEM-Step

OFR GxExM: Genotype x Environment x Management

MANAGEMENT
Mid-season Imagery Analysis (e.g. UNIFORMITY)

UAV: VI 10 x10 (7/8/16) showing trends

UAV (drones)

Landsat (Satellite Imagery)

Landsat8: (8/15/15) Left:False Color; Right: NDVI
On-Farm Research (OFR): GEM-Step

OFR GxEExM: Genotype x Environment x Management

MANAGEMENT

HARVESTING: Calibrated yield monitor and GPS
Avoid borders or heads of the strips or angles

ENVIRONMENTS

STRIP TRIALS

Harvest-center
60-ft wide
30-ft (12-rows)
On-Farm Research (OFR): ARI-Step

**ANALYSIS/RESULTS**

**Overall Outcome, Density-response**

<table>
<thead>
<tr>
<th>Yield Advantage (per acre)</th>
<th>Revenue Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase 19,747 to 21,849</td>
<td>$15.91</td>
</tr>
<tr>
<td>Increase 21,849 to 25,223</td>
<td>$50.03</td>
</tr>
<tr>
<td>Increase 25,223 to 25,555</td>
<td>$81.82</td>
</tr>
<tr>
<td>Increase 25,556 to 28,321</td>
<td>$81.97</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost Analysis (per acre)</th>
<th>Net Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase 19,747 to 21,849</td>
<td>$8.97</td>
</tr>
<tr>
<td>Increase 21,849 to 25,223</td>
<td>$38.90</td>
</tr>
<tr>
<td>Increase 25,223 to 25,555</td>
<td>$80.72</td>
</tr>
<tr>
<td>Increase 25,556 to 28,321</td>
<td>$72.84</td>
</tr>
</tbody>
</table>

**STRIP-by-STRIP outcome**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>15 inch rows</th>
<th>30 inch rows</th>
<th>A randomization test suggested strong evidence of a significant yield difference.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield Averages (bu/acre)</td>
<td>40.4</td>
<td>37.7</td>
<td></td>
</tr>
</tbody>
</table>
On-Farm Research (OFR): ARI-Step

INTERPRETATION

Density-response by MANAGEMENT ZONE

ENVIRONMENTS

STRIP TRIALS

FLAT response
LOWER
Econ. Opt.
Seeding Rate (EOSR)

CURVILINEAR response
HIGHER EOSR, increasing with yields

EOSR = Economically Opt. Seeding Rate
AOSR = Agronomically Opt. Seeding Rate
On-Farm Research (OFR): ARI-Step

INTERPRETATION

Presentation of Results and Feedback

Image 1. Meeting with farmers and KSUCROPS Production & Tech Lab research team to share the results of the 2015 growing season.

FARMERS better informed to take decisions related to management systems x improving on-farm profits.
Integration of OFR with Precision Ag Tools
Site-specific management = + $$\$$

CEMA, 2016: http://cema-agri.org
OFR is critical but… **Challenges**

- Time-Consuming
- Logistics and Equipment
- Perception of the Project “true-value”
- Record Keeping
- Attention and details
- Communication with Agents and Specialist

*On-farm research provides benefits for fine-tuning site-specific best management practices (BMPs).*
KNOW your OFR…. In your State

On-Farm Research RESOURCES

Farmer Network Design Manual
A Guide for Practitioners, Advisors and Research Partners

Nebraska On-Farm Research Network
Grower’s Guide to On-Farm Research
Discover how new products and practices will work on your farm with on-farm research.

Guide to On-Farm Replicated Strip Trials

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THANKS! QUESTIONS?

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